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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 06/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/826,458

Applicant(s)

HANSEN ET AL.

Examiner

Rakesh K. Dhingra

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 April 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 134-149 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 134-149 is/are rejected.
- 7) ☒ Claim(s) 138 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

Claim 138 is objected to because of the following informalities:

Claim 138, line 1 recites "The method of claim 134-----surface" whereas

Claim 134 is an apparatus claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim recites in part "wherein the source is moveable between a closed position and an open position" which is not disclosed, since as per specification (page 7, lines 10-17) source of process fluid is disclosed as being separate from the manifolds 18, 22 and further, only the manifolds 18, 22 (and not the source) are disclosed to be movable (page 6, line 12 to page 7, line 2). For the purpose of examination on merits this limitation has been interpreted as "wherein at least a connecting part between the

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source and the lower portion of the chamber is moveable between a closed position and an open position”.

Terminal Disclaimer

The terminal disclaimer filed on 04/10/2006 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US Patent No. 6,726,848 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Response to Arguments

Applicant's arguments filed On 4/10/06 have been fully considered but they are not persuasive as explained hereunder.

Applicant has amended claim 134 by adding new limitation “wherein the source is moveable between a closed position and an open position”, and added new claims 146-149.

Applicant argues that reference by Andreas et al do not teach the limitation of amended claim that is, wherein the source is moveable between a closed position and an open position.

Examiner responds that Andreas et al teach a recirculation system 40 (Figure 1) connected to lower portion of the process chamber and though not explicitly disclosed, such recirculation system would inherently include a valve system movable between open and close positions to control supply and drainage of process fluid from/to the lower portion of chamber 10. Further, a new reference has been found (Bran - US patent No. 5,556,479) that when combined with Andreas et al reads on amended claim

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134 limitations. Accordingly claim 134 and dependent claims 135, 137, 141, 143, 145 have been rejected under 35 USC 103 (a) as explained below. Further, dependent claims 136, 138, 139, 142 and 144 have also been rejected under 35 USC 103 (a) as explained below. New independent claim 146 and its dependent claims 147-49 have also been rejected under 35 USC 103 (a) as explained below.

Further, since the Terminal Disclaimer filed 04/10/2006 has been accepted, the double patenting rejection of claims 134-142 has been withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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Claims 134, 135, 137, 141, 143, 145-149 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andreas et al [(US Patent No. 6,273,100) in view of Bran (US Patent No. 5,556,479)].

Regarding Claims 134, 137: Andreas et al teach an apparatus (Figure 1) 1 for treating and drying a substrate, the apparatus comprising:

a chamber proportioned to process at least one substrate 3, the chamber including a submersion chamber (lower portion) 10 and a drying chamber (upper portion) 30;

a recirculation system (source of process fluid) 40 fluidly coupled to the lower portion of the chamber;

spray nozzles (source of drying vapor) 33 fluidly coupled to an upper portion of the chamber configured to provide an atmosphere of drying vapor (by means of wall 32, door 57) in the upper portion;

a wafer conveyor (end effector) 15 movable between the lower portion of the chamber and the upper portion, the end effector operable to withdraw a substrate from process fluid in the lower portion 10 into the atmosphere of drying vapor in the upper portion 30; and,

megasonic transducers 28 positioned to direct megasonic energy into process fluid in the chamber 10 in a direction normal to substrate surface (Column 4, line 40 to Column 6, line 60).

Andreas et al does not explicitly teach a source of process fluid that is movable between open and closed positions.

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Bran teaches an apparatus for processing semiconductor wafers that includes a three position valve (part of source of process fluid) 48 that controls introduction/drainage of process fluid to the container (chamber) 28. Bran further teaches that valve 48 has three positions (movable) of open/close/drain (column 5, lines 30-48).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a source of process fluids control that is movable between open and closed position as taught by Bran to control supply/drain of process fluid from/to the process chamber.

Regarding Claims 135,145: Andrea et al teach (Figure 1) that the megasonic transducers 28 are positioned to form a band of megasonic energy propagating towards a surface of the Substrate 3, wherein the end effector 15 is positioned to move the substrate through the band. Further, it is known in the art that megasonic energy induces thinning of a fluid boundary layer on a portion of the substrate that passes through the megasonic energy band. Andrea et al also teach that (Column 6, lines 10-25).

Regarding Claim 141: Andreas et al teach that drying vapor includes isopropyl alcohol (Column 7, lines 1-10).

Regarding Claim 143: Andreas et al teach that process fluids include deionized water (Column 2, lines 55-60).

Regarding Claims 146,148,149: Andreas et al teach an apparatus (Figure 1) that includes:

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a chamber (comprising of submersion chamber 10 and drying chamber 30) having an opening in an upper portion of the chamber that is sized to receive at least one wafer; a processing region proportioned to receive the at least one substrate 3, wherein the processing region has a submersion chamber (lower interior portion) 10 and a drying chamber (upper interior portion) 30; megasonic transducers 28 (means for causing turbulent flow) coupled to the chamber in the lower interior region; an inlet and an outlet (part of recirculation system 40) and coupled to the chamber 10 and in fluid communication with the submersion chamber (lower portion of the chamber) 10 (column 4, line 45 to column 6, line 55).

Andreas et al do not teach opening in the upper portion of the chamber sized to receive at least one substrate and an overflow weir coupled to the upper interior portion, the overflow weir having at least two ports coupled thereto.

Bran teach a wafer processing apparatus (Figures 2, 3) that includes a processing container 28 for processing wafer 26 and where the container includes a pair of weirs 40 located at the top of the processing container 28 (column 4, line 35 to column 5, line 15).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a pair of weirs as taught by Bran in the apparatus of Andreas et al to enable capture the fluids that overflows the upper portion of the processing container.

Regarding Claim 147: Andreas et al teach that apparatus includes wafer conveyor (like end effector) 15 (Figure 1 and column 4, line 60 to column 5, line 10).

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Claims 136, 139, 142, 144 are rejected under 35 U.S.C. 102(e) as being unpatentable over Andreas et al (US Patent No. 6,273,100) in view of Bran (US Patent No. 5,556,479) as applied to Claim 135 and further in view of Fishkin et al (US Patent No. 6,328,814).

Regarding Claim 136: Andreas et al in view of Bran teach all limitations of the claim but do not teach specific speed of moving substrate by end effector through megasonic band.

Fishkin et al teaches an apparatus (Figure 1A) that includes a substrate cleaning and rinsing tank 13, a drying tank 19 and a programmable controller 31 that is coupled to substrate lifting mechanism 17. Fishkin et al also teach that timing of lifting mechanism 17 is linked with the time during which a substrate is cleaned by megasonic energy (Column 4, line 40-50 and Column 6, lines 1-10). Thus time of substrate withdrawal by end effector could be programmed (optimized) as per process requirements.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to program the time of substrate withdrawal by end effector as per process requirements as taught by Fishkin et al in the apparatus of Andreas et al in view of to enable achieve process control.

In this regard courts have ruled (Case law):

“It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).”

“It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).”

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Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).”

Regarding Claims 139, 140: Fishkin et al teach (Figure 1B) use of hot nitrogen supplied through nozzle (not shown in drawing) to volatilize fluid from surface of substrate.

Fishkin et al also teach that lifting mechanism 17 moves the substrate past the holes for entry of hot nitrogen to accelerate evaporation (Column 5, lines 45-55).

Regarding Claim 142: Fishkin et al teach that apparatus (Figure 1A) includes drying tank 19 whose walls contain a plurality of holes (not shown in drawing) for exhausting residual vapors into an exhaust system (not shown in drawing) [Column 3, line 45 to Column 4, line 13].

Regarding Claim 144: Fishkin et al teach that apparatus (Figure 1a) is proportioned to process one wafer at a time.

Claim 138 is rejected under 35 U.S.C. 102(e) as being unpatentable over Andreas et al (US Patent No. 6,273,100) in view of Bran (US Patent No. 5,556,479) as applied to Claim 134 and further in view of Fishkin (US Patent No. 6,311,702).

Regarding Claim 138: Andreas et al in view of Bran teach all limitations of the claim except that direction of megasonic energy is normal to substrate surface.

Fishkin teaches an apparatus (Figures 2A) that comprises a substrate cleaning tank 19a that includes a substrate W, megasonic transducer/focuser assemblies 11sub. 1a, 11sub.1b and a wafer scanning mechanism 29 for up/down vertical movement of the substrate. Fishkin further teaches (Figures 3-5) that angle of transducer/focuser

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assembly with respect to wafer, and angular coupling between transducer and focuser can be changed as per requirements. Fishkin also teaches that rays from focuser are in the range of 10 –80 degrees (less than normal) relative to wafer surface (Column 4, line 55 to Column 5, line 20 and Column 6, line 10 to Column 7, line 25 and Column 9, lines 1-15).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the required orientation of megasonic energy through control of orientation of megasonic transducer and the focuser as taught by Fishkin in the apparatus of Andreas et al in view of to increase efficiency of the megasonic transducer assembly (Column 2, lines 20-32).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rakesh Dhingra



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